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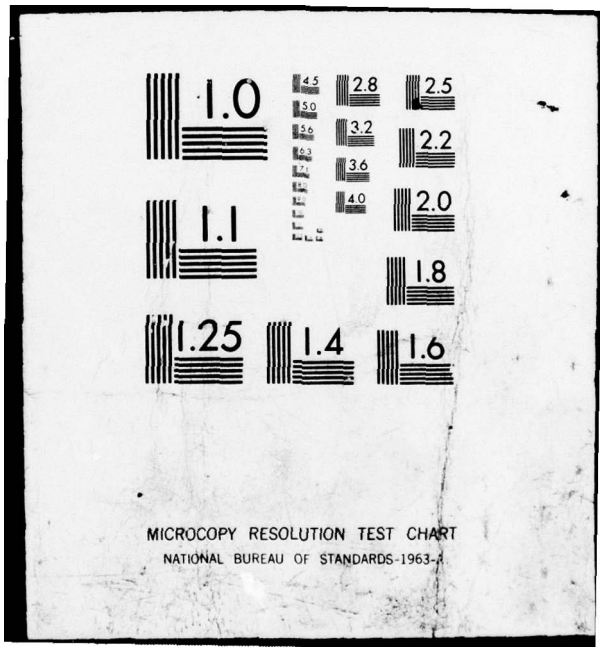
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A NEW METHOD OF STERILIZATION: THE CARBON DIOXIDE LASER

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ABSTRACT

The use of the Carbon Dioxide (CO_2) laser for sterilization of metal instruments was investigated. Scalpel blades contaminated with bacterial spores were exposed to the laser and subsequently cultured. Our results demonstrate that the CO_2 laser effectively sterilizes metal instruments.

INTRODUCTION

The Carbon Dioxide (CO_2) laser is reflected by metal surfaces and is virtually completely absorbed by biologic tissues, resulting in their vaporization (Strong & Jako 1972). In view of these facts, it seemed appropriate to investigate the possibility of vaporizing microorganisms from the surface of surgical instruments in order to render them sterile.

MATERIALS AND METHODS

A CO_2 laser system,* coupled with an operating microscope,† was used in this study. Twenty-six #15 scalpel blades were divided into two equal groups and modified by cutting off the portion which is normally intended to attach to the handle. One group of thirteen blades was contaminated with the spores of Bacillus subtilis and the

* Coherent Medical, Model 400, Palo Alto, California

† Zeiss OPMI 1, Zeiss House, New York, New York

other group of thirteen blades with the spores of Clostridium sporogenes. Preparation of spores, contamination of blades, and spore drying were performed using a modification of the Association of Official Analytical Chemists (A.O.A.C. 1966) method. Ten blades from each group were exposed to the laser at 10 watts in the continuous mode for 1.5 to 2.0 minutes each. During the exposure, the scalpel blade was held by a sterile hemostat and the beam was moved over all the visible surface in a sweeping motion. When this was completed, a second sterile hemostat was used to grasp the blade in the laser exposed area and the surface which had been hidden beneath the first hemostat was exposed to the laser. After completion of the laser exposure, the blades were placed into tubes containing thioglycolate medium and incubated for 21 days at 37°C. The controls, three from each group, were treated in exactly the same manner, but they were not exposed to the CO_2 laser.

RESULTS

None of the thioglycolate media (20 tubes) containing the laser exposed blades showed any evidence of growth during the 21 days of incubation.

All of the controls demonstrated growth of the microorganisms within the 21 day observation period.

DISCUSSION

It was our intention to determine whether a CO_2 surgical laser

has the ability to kill microorganisms on the surface of metal instruments. If possible, this ability would add another dimension to the clinical laser device.

Our findings demonstrate that every sample which was exposed to the laser was sterilized.

Excessive cost related to instrument purchase and operator time may not justify acquisition of the laser for sterilization only. However, those who possess or purchase a surgical laser should be aware of its ability to sterilize metal instruments or implants. This method of sterilization could be used in the operating room for an instrument or implant which may have become accidentally contaminated. It might also be used for metal instruments which are not amenable to other sterilization methods. Assuming that the instrument is already available, use of it for sterilization could save time for the entire operating room staff.

During the blade exposures, it was noted that an occasional blade (total of four) became heated sufficiently to cause a slight color change in the metal. This was seen only when the dry spore deposits on the blade were extremely heavy and required a longer laser exposure to vaporize it. A portion of the heat of vaporization was apparently transferred to the metal blade. This minor problem would be obviated in actual clinical use by simply washing off the gross material from the instrument to be sterilized. This is, of course, the standard procedure that one follows in preparation

for sterilization.

In summary, a new method of sterilization of metal instruments or devices has been demonstrated.

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Commercial materials and equipment are identified in this report to specify the investigative procedure. Such identification does not imply recommendation or endorsement, or that the materials and equipment are necessarily the best available for the purpose. Furthermore, the opinions expressed herein are those of the authors and are not to be construed as those of the Army Medical Department.

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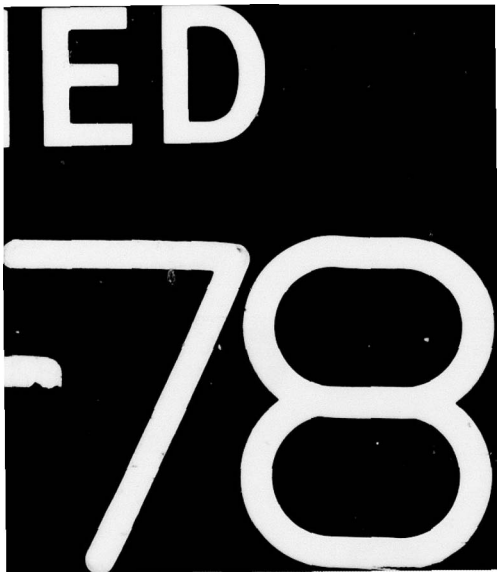
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